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**Remarks**

Applicant and his representatives wish to thank Examiner Webb for the thorough examination of the present application, and the detailed explanations in the Office Action dated June 23, 2006.

The present invention relates to a method for removing polymers generated during etching processes, comprising the steps of removing the polymers by using an inorganic compound including DIW, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>O<sub>2</sub> and HF; forming a protective oxide film on a metal line, a via hole or a pad open area by using H<sub>2</sub>O<sub>2</sub>; and protecting the metal line, the via hole or the pad open area by the protective oxide film while removing the polymers by using HF. DIW occupies by volume about 70.5% to about 80.5% of the total volume of DIW, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>O<sub>2</sub> and HF, H<sub>2</sub>SO<sub>4</sub> occupies by volume about 6.5% to about 8.5% of the total volume of DIW, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>O<sub>2</sub> and HF, H<sub>2</sub>O<sub>2</sub> occupies by volume about 15% to about 19% of the total volume of DIW, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>O<sub>2</sub> and HF, and HF occupies by volume about 50 PPM to about 150 PPM of the total volume of DIW, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>O<sub>2</sub> and HF. The total volume % of DIW, H<sub>2</sub>SO<sub>4</sub>, H<sub>2</sub>O<sub>2</sub> and HF is about 100 %.

According to the present invention, the polymers are removed by using the inorganic compound including about 70.5% to about 80.5% of DIW, about 6.5% to about 8.5% of H<sub>2</sub>SO<sub>4</sub>, about 15% to about 19% of H<sub>2</sub>O<sub>2</sub> and about 50 PPM to about 150 PPM of HF. It is believed that the references cited against the claims do not disclose removing polymers using an inorganic compound including about 70.5% to about 80.5% of DIW, about 6.5% to about 8.5% of H<sub>2</sub>SO<sub>4</sub>, about 15% to about 19% of H<sub>2</sub>O<sub>2</sub> and about 50 PPM to about 150 PPM of HF. Accordingly, the rejections of the present claims are believed to be unsustainable.

**The Rejections of Claims 9-16 under 35 U.S.C. § 102(b) in view of Jolley**

The rejection of Claims 9-16 under 35 U.S.C. § 102(b) as being anticipated by Jolley (U.S. Pat. No. 5,489,557), Bran (U.S. Pat. No. 5,950,645), Clark (U.S. Pat. Appl. Publ. No.

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2001/0051128), Liu (U.S. Pat. Appl. Publ. No. 2002/0033186), Ramachandran (U.S. Pat. No. 6,630,074) Berry (U.S. Pat. No. 6,630,406), and Yoneda (U.S. Pat. No. 5,896,857) is respectfully traversed.

It is believed that Jolley teaches a rinsing step using purified water, a cleaning step with an aqueous solution of  $\text{H}_2\text{SO}_4/\text{H}_2\text{O}_2$ , a treatment step with an aqueous solution of  $\text{NH}_4\text{OH}/\text{H}_2\text{O}_2$ , and a stripping step using an aqueous HF solution. However, it is believed that Jolley is silent with regard to an inorganic compound including all of DIW,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{O}_2$  and HF which is used together in one step. Further, Jolley does not appear to teach the volume percentages of the compositions defined in claim 9 above.

It is believed that Bran teaches the step of removing organic residues including two substeps which use a compound of  $\text{H}_2\text{SO}_4/\text{H}_2\text{O}_2$  and HF respectively, and a post-etching process which is believed to use one of  $\text{NH}_4\text{OH}/\text{H}_2\text{O}_2/\text{DIW}$  or  $\text{H}_2\text{O}/\text{H}_2\text{O}_2/\text{HCl}$ . However, it is believed that Bran does not disclose an inorganic compound including all of DIW,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{O}_2$  and HF which is used together in one step. Further, Bran does not appear to teach the volume percentages of the compositions defined in claim 9 above.

It is believed that Clark teaches a step using HF/DIW, a step using  $\text{H}_2\text{SO}_4/\text{H}_2\text{O}_2$ , and a post-etching process. However, it is also believed that Clark does not state a step of removing polymers using an inorganic compound including all of DIW,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{O}_2$  and HF. Furthermore, Clark does not appear to disclose the volume percentages of the compositions defined in claim 9 above.

It is believed that Liu relates to a process for treating an electronic component, wherein the electronic component is exposed to a heated solvent and subsequently exposed to an ozonated process fluid. However, Liu does not appear to disclose the volume percentages of the compositions defined in claim 9 above.

It is believed that Ramachandran teaches an aqueous etchant composition containing about 0.01 wt% ~ about 15 wt% of  $\text{H}_2\text{SO}_4$ , about 0.01 wt% ~ about 20wt% of  $\text{H}_2\text{O}_2$  about 0.1 PPM ~ about 100 PPM of HF. However, the percentages disclosed by Ramachandran appear to

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be percentages by weight, which are believed to be different from percentages by volume as defined in claim 9 above.

It is believed that Berry teaches  $\text{H}_2\text{SO}_4$  or HF as wet strippers and discloses a rinsing step using DIW and a general post-etching process. However, it is also believed that Berry is silent with regard to an inorganic compound including all of DIW,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{O}_2$  and HF which is used together in one step. Further, Berry does not appear to teach the volume percentages of the compositions defined in claim 9 above.

It is believed that Yoneda teaches a cleaning solution which is one of a mixed solution of aqueous ammonium, hydrogen peroxide and ultra pure water, a mixed solution of hydrochloric acid, hydrogen peroxide and ultra pure water, a mixed solution of sulfuric acid and hydrogen peroxide, a mixed solution of hydrofluoric acid and ultra pure water, a mixed solution of hydrofluoric acid and ammonium fluoride, and a mixed solution of hydrofluoric acid, hydrogen peroxide and ultra pure water. However, it is also believed that Yoneda is silent with regard to an inorganic compound including all of DIW,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{O}_2$  and HF which is used together in one step. Further, Yoneda does not appear to teach the volume percentages of the compositions defined in claim 9 above.

Therefore, it is believed that each of Jolley, Bran, Clark, Liu, Ramachandran, Berry, and Yoneda fails to disclose all of the limitations recited in claim 9 (notably, removing polymers using an inorganic compound including about 70.5% to about 80.5% of DIW, about 6.5% to about 8.5% of  $\text{H}_2\text{SO}_4$ , about 15% to about 19% of  $\text{H}_2\text{O}_2$  and about 50 PPM to about 150 PPM of HF). Consequently, it is most respectfully requested that the rejection of claims 9-16 be withdrawn.

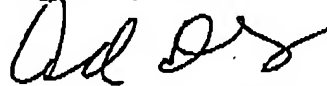
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Conclusions

In view of the above amendments and remarks, all bases for rejection are believed to be overcome, and the application is believed to be in condition for allowance. Early notice to that effect is earnestly requested.

If it is deemed helpful or beneficial to the efficient prosecution of the present application, the Examiner is invited to contact Applicant's undersigned representative by telephone.

Respectfully submitted,



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